



FARNSWORTH
HEAT RECLAMATION
ENGINEERS
CONSHOHOCKEN PENNA

**SYSTEMS
AND
UTILITIES**

EQUALIZED PRESSURE DRAINAGE SAVES FUEL

Drainage Receiver Pumps
Boiler Feeding Systems
Fuel Saving Systems

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Some Desirable Territories
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FARNSWORTH COMPANY

HEAT RECLAMATION SYSTEMS

Engineers and Manufacturers

CONSHOHOCKEN, PA.

EQUIPMENT
AND
SYSTEMS
OF THE
BETTER KIND

NOTICE

Good things are usually protected. This Company has always believed in protection, and that the great success of its *Systems* and *Steam Specialties* has merited the best protection possible for them. The public and *Trade* are, therefore, advised that the policy of *Patent* protection, in the *United States* and Foreign Countries, will be continued as heretofore, covering its *Systems* and *Specialties* set out in this catalogue, together with further additional protection for all future improvement which it may add to its present lines of work.

Any person, firm or corporation infringing upon the patents of the Farnsworth Company will be restrained by legal procedures.

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Heat Reclamation Engineers

OUR engineering service comprises just a service to engineers, architects, owners, etc., covering heat reclamation and providing ways and means with special equipment and systems of increasing drying and heating capacity, with less fuel.

The engineering service is made necessary because of the newness to engineers of some of the systems, equipment and methods recently developed, and because of our policy of creating demand for our equipment and systems by giving engineers and owners a plant survey report of their present costs compared with the lessened costs that our systems and engineering services would produce.

Practically every plant has wastes that would be startling if the figures were properly presented. The principle loss in mills using

a great deal of steam for drying and heating, is in production through imperfect elimination of condensation, due to lack of circulation and proper drainage of the heated units. Further, wastes prevail through the loss of heat units occasioned by the improper handling of condensate after it has been drained from the heated unit. Our experience repeatedly leads us to plants blissfully contented with their steam conditions, yet, upon analysis we find thousands of dollars going to waste in curtailed production and wasted heat units.

Our long experience in this specialized field of engineering enables us to so adapt to your individual problems the general principles involved in Farnsworth Systems, that several, at least, of the following advantages are sure to result.

1. REDUCED FUEL COSTS.
2. IMPROVED QUALITY OF PRODUCT.
3. INCREASED DRYING CAPACITY AND INCREASED PRODUCTION.
4. MORE UNIFORM TEMPERATURES.
5. REDUCED BACK PRESSURE ON ENGINES.
6. HIGHER FEED WATER TEMPERATURES.
7. ELIMINATION OF SURPLUS PIPING AND OPERATING PARTS.
8. REDUCED MAINTENANCE AND OPERATING COST.

The economy obtained from this system is in the fact that by forcing the steam through the various drying and heating units, drying and heating capacity is increased because all water and air is forced out. Increased production shows up as well as improved quality;

also reduced fuel costs by properly pumping the water under pressure, and reclaiming heat by retaining the sensible heat. All of which is very important to plants desiring more production with less fuel, which are two of the most important things in paper mills.

Pressure Drainage and Pumping Saves Coal Why?

They provide ways and means of reclaiming heat by closing up the entire system and by keeping steam moving at high speed through the heating and drying systems, pushing the water and air out ahead of it. They also provide means for holding the water under pressure until it is back in the boiler at the highest possible temperature. Obtaining utmost economy in fuel and greater drying and heating capacity is explained as follows:

To pump water at the temperature of steam means that the temperature is always above 212 degrees at 50 lbs. pressure it is about 297 degrees, therefore, a centrifugal or piston pump cannot be used. The Farnsworth Pump receives the water at these high temperatures and when the tank fills, automatically applies H. P. steam directly on top of the accumulated water. The water is thus forced out of the tank at high speed through small pipes to the boiler house and into the final central receiving chamber above the boiler, known as the Farnsworth Boiler Feeder. There the final push is given to the water by application of boiler pressure, which equalizes the receiving tank with the boiler not only causing the water to retain its heat but moving it rapidly into the boilers with

one quarter of the steam consumption of any centrifugal or piston type pump.

We have obtained simplified systems and equipment that will handle high temperature water and stand up against hard wear and tear and provide a dependable continuous service with lowest maintenance cost.

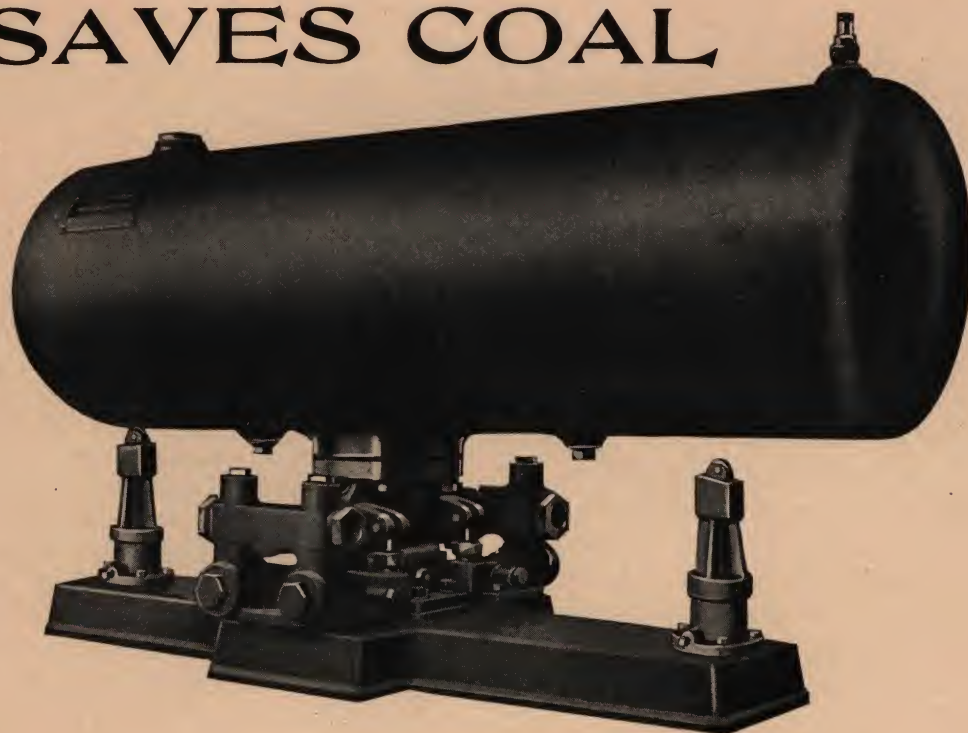
To provide a system such as described requires not only good equipment for pumping high temperature water, but a thorough knowledge of steam and drainage, which this Company has acquired through years of field experience and by the expenditure of large sums for research and development work.

The whole program is one of saving B. T. U.s and making the B. T. U.s that are in the steam or in the water in the form of sensible heat do more work, and our job is confined to this particular field as closely as possible.

As pioneers and leaders in this field we intend to continue our research and development work on our equipment and systems, also to so develop, educate, and constantly improve our engineering force that we may remain in our present position.

Farnsworth Drainage Receiver and Pump or Boiler Feeder (Tilting Type)

SAVES COAL



FOR DRAINING AND PUMPING HIGHEST TEMPERATURE WATER UP TO 400 DEGREES OR MORE, IF NECESSARY. ALSO COLD WATER OR OTHER LIQUIDS.

Using H. P. steam, air or gas applied directly to the surface of the accumulated liquid as the medium of forcing the contents from the tank.

SEE IT OPERATE

There is a satisfaction in seeing it operate and in knowing when and how it functions.

SAVES COAL AND WHY

More fuel is wasted in steam plants of all kinds from lack of knowledge of proper drainage and by using the wrong type of equipment than from any other source of waste in a steam plant for two reasons: first, the waste of fuel by loss of B. T. U.s by allowing condensate to get out from under pressure by improper drainage of the units; second, from heating or drying systems causing loss of drying or heating capacity and thus resulting in loss of production.

Liquids held under pressure retain the sensible heat. For illustration, water in the steam boiler is held under pressure, but admit it to atmospheric pressure and the heat immediately flashes and the B. T. U.s are lost.

These pumps never allow the condensate or other liquids to become released from pressure, which retains the sensible heat, and B. T. U.s saved mean coal saved.

These pumps take the high temperature condensate away from drying systems or heating systems, and pump it at the high temperature directly into your boiler, not to a heater or hot well, where it would be cooled down to 212 degrees or lower so that a common pump could handle it.

Water put into the boiler at high temperatures (See Page 11) will positively save coal. All any boiler is meant to do is to heat water until it generates steam. If that water is fed into the boiler at a temperature nearer the generation point why should it not save coal? We are doing it in many very important mills, and can do it for you.

Feed your water into your boiler with a pistonless pump and avoid the use of lubricating oils, packing and use only a quarter of the steam required by the common centrifugal or piston pump and save millions of B. T. U.s daily in the high temperature water.

Farnsworth Drainage Receiver and Pump

(Tilting Type)

HISTORY OF PUMP

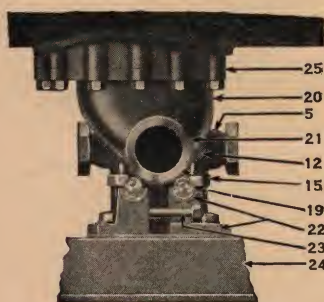
This pump has been finally perfected and developed after 15 years of constant improvement.

F. C. Farnsworth, with untiring determination to build a pump that would stand up against hard wear and tear, has finally suc-

ceeded. During this period of development more than 1,000 plants were equipped with pumps of various types and hardly a month went by that some new improvement was not tried. The handling of very high temperature condensate with the foreign elements, sediment, etc., is unquestionably the hardest known service in any plant.

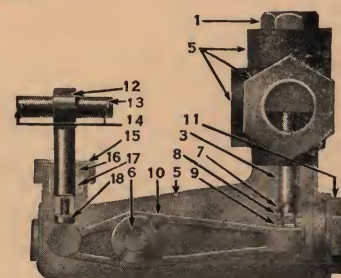
DESCRIPTION

Roller Bearings carry the weight of the tank and eliminate friction. They also centralize the packings in the trunions which make possible tight packings for years. This eliminates the undesirable feature in most tilting traps of carrying the weight of the tank on the packings making it necessary to tighten the packings too hard to compensate for the out of round packings and the gap at the top of the trunions. By this elimination of friction the operating power of the movement of the tank is effective at the valves for positive operation.



SIDE VIEW OF VALVE

Showing side elevation of valve and how with the tank coupled to the pin pressing down on the compounded cross rocker arm, the main valve is lifted open very easily because of the pilot operation; this rocker arm is always submerged in condensate and the steam does not touch the packing at the plunger pin. The valves are housed without friction of packing in the principle operating parts of the valve movement.

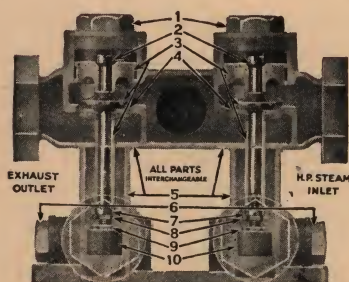


STEAM AND EXHAUST VALVES

Showing construction of the steam and vent valves and how these valves alternately open and close as the pump operates.

When the steam valve is open the vent valve is closed.

Each valve is attached to a piston which is larger in diameter than the valve and when the little pilot valve which extends through the piston and main valve to the lower chamber is pushed up by the rocker arm, the pressure above the piston is released to lower pressures below the main valve. This causes the piston to travel up with a snap and open the steam valve without any wire draw. At the same time the rocker arm of



the vent valve drops, letting the vent valve close so that the steam is directed into the tank until the water is blown out. Then the movement of the tank acting on the rocker arms again reverses the valves.

The valves are the most important parts of the pump, in fact, there are practically no other wearing parts that would not last a life time.

The valves are required to open and shut constantly about once every minute, depending,

of course, on the load, for 24 hours per day and 300 days per year, especially in paper mills where the pumps have been most in demand.

To stand this service only the best of materials can be used; monel seats and discs are used throughout.

Valve engineers and users everywhere are complimenting us on the unique, rugged, compact simplicity that insures long life.

Ten minutes will renew the seats and discs, and then the pump is like new.

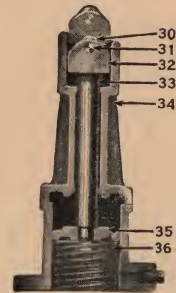
Farnsworth Drainage Receiver and Pump

(Tilting Type)

WATER SEAL

The valves always close before the water has completely left the tank, thus leaving a large quantity of water, as a water seal, ahead of the steam.

The *Oil Dash Pots* are roller bearing to provide for the arc in travel after the tank hits them and so constructed that quiet easy operation is assured. They make the movement of the tank steady and smooth as it drops to the bumper when operating the control valves. A large tank with its unique method of compounding its operating force, makes the use of these oil dash pots very necessary to make the tank move slowly, noiselessly and gently.



Oil Cushioned Roller
Bearing Dash Pots

POSITIVE OPERATION

Compound operating leverage and operation explained. When the collecting chamber fills the weight of the liquid overbalances the counter-weighted tank, the downward movement of the tank causes an endways surge of the liquid towards the end of chamber effecting a compound leverage which overcomes all resistance and friction of valves and packings. This movement automatically provides the dependable, positive operation of the control valves, comprising the valve that admits H. P. steam, gas or air, and the exhaust valve.

METERING FEATURE

The cycle of full and empty tank operation makes metering of the liquids that are drained comparatively accurate.

The frictionless feature effected by the roller bearings, combined with the pilot operation of the piston connected valves make the movement of the tank and the operation of the valves possible with but little effort. The pump discharges the same amount of liquid each operation and by the attachment of a recording thermometer for showing temperatures and a counter for recording the number of operations, an accurate record of the amount of steam used in the system or heated unit is obtained.

The value of this method is that it shows the temperature of the condensate so that proper allowances may be made for the value of the heat units saved. This method is more accurate and dependable than flow meters in the steam line as it meters regardless of pressure, condition of steam, or volume; and is done

by actual weight as accurate as a pair of scales. As a matter of fact it is weighed exactly in the same manner.

COUNTER WEIGHT FEATURE

The tank is counter weighted with sand after purchaser gets it to eliminate shipping weight and handling into place. We feel that a few pails full of sand are always available and in the thousands of machines shipped this method of counter weight has met with approval.

TEST

Each pump is tested to 350 lbs. hydrostatic pressure and is set on a test block and put through a hard test of actual operation similar to the condition in the field, with very high pressure steam so that when the machine is put into operation it should give immediate satisfactory service.

SUGGESTIONS TO USERS

As this machine has been designed to handle high temperature water or liquids of any kind, the service is very hard and the efficiency it provides should warrant careful consideration to the small maintenance necessary to keep it in complete repair.

The machine being entirely automatic, will work through a long period without maintenance service, but when the valves need regrinding, a very few minutes will make them like new and when the packings need renewing a few minutes will put them in good order. The total time for keeping the unit in good order will not equal the cost of the lubricating oils used in the average pump.

Farnsworth Drainage Receiver and Pump

(Tilting Type)

SIZES AND TYPES

Farnsworth Pumps are made in four sizes, classified according to size of water inlet connections. These are 1", 1½", 2" and 3". They are made in types for various services as shown on following pages.

CAPACITIES

To determine the proper size of pump for any given condition it is necessary to decide which of the above mentioned sizes will adequately drain the heated unit into a closed tank of equal pressure by gravity. The reason for

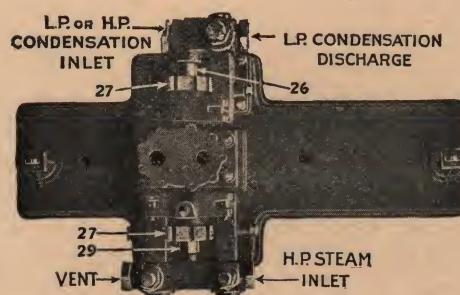
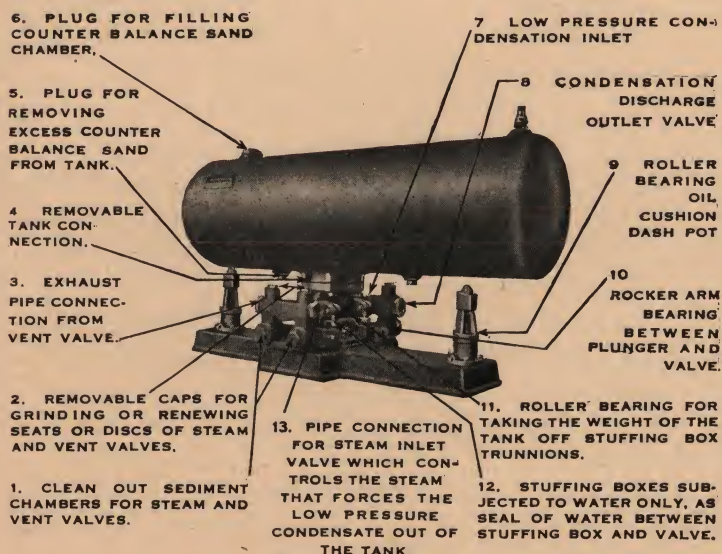
this is that the static head between the heated unit and the Farnsworth Pump is the only force exerted to carry the water into the tank. The pump will discharge water as fast as it will flow to it; therefore, the only factor to determine is the size of return line to carry the condensate to the pump and the pump will be the same size. It is urged that careful consideration be given to pipe sizes, and we also stress that the pump be set as far below the unit to be drained as possible so as to take full advantage of all available static head.

Table Showing Size of Pipe Connections
Condensation Pump

Size of Pump	Conden. Inlet Inches	Conden. Outlet Inches	H. P. Steam Inlet Inches	Exhaust Outlet Inches	Approximate Lbs. of High Temperature Water Units Will Drain and Pump per Hour
1	1	1	¾	¾	2500
1½	1½	1	¾	¾	4500
2	2	1½	1	1	6000
3	3	2	1½	1½	9000

A unit built so well that owing to its exceptional quality the price puts it out of the run in price competition, but if quality and

continuous, dependable service through many years is desired, then our price is less than that of any other.



Showing base with tank removed and where to connect the various pipes.

ORDER BY NAME AND NUMBER

Interchangeable Parts

Every part is made from accurate jigs so that they are always interchangeable and each part is properly named or numbered so that replacement is possible.

Farnsworth Drainage Receiver and Boiler Feeder

(Tilting Type)

STEAM CONSUMPTION

Because this pump will displace a cubic foot of water with a cubic foot of steam it means that when it is feeding water into boilers it uses the full cubic foot of steam for each cubic foot of water displaced. When pumping water to points less than boiler pressure, the expansion of steam reduces the steam consumption in proportion to the reduction in pressure. In all cases less than $\frac{1}{4}$ of the steam is consumed than the average centrifugal or piston pump uses.

GUARANTEE

Each and every pump is built of the best of materials and guaranteed to be free from defective workmanship, materials, etc.

DELIVERY

All machines are sold F. O. B. our works, unless otherwise agreed upon and all sizes are carried in stock for immediate delivery.

WHO USES THE PUMP?

Those desiring to handle hot liquids, hotter than the centrifugal or piston type pump will handle. Also those wanting economy in pumping and wanting to save fuel by saving the B. T. U.s in water above 212 degrees.

WHY DO PAPER MILLS USE THEM?

Because in pumping high temperature condensate from the largest and fastest paper machines, only dependable equipment can be used, as production rests with the positive removal of condensate as fast as it accumulates. Further such large volumes of steam are used for drying that millions of heat units are saved daily by pumping the large volume of condensate while it is hot so that the B. T. U.s are saved.

High temperature water cannot be pulled but can be pushed. The Farnsworth Pistonless Pump pushes it.

3 Mills Pump 5,000,000 lbs. High Temperature Water Daily With This Type

ABITIBI POWER AND PAPER CO.
DONNACONA PAPER COMPANY
ST. LAWRENCE PAPER COMPANY

have standardized on them. In these three mills about 5,000,000 lbs. of high temperature condensate are being handled daily from paper machines, heating systems, etc., satisfactorily and efficiently.

Our broad experience in handling all kinds of problems involving high temperature water, the distribution of steam for improving drying and heating conditions, for removing the water and air so that greater drying and

heating capacity will be available, might be valuable to you. We gladly furnish this, not as consultants, but as sales engineers, interested in saving fuel and improving conditions for greater production for our customers.

As specialists in this field, the service goes with our equipment.

We have saved fuel and made it possible to obtain more production in so many plants of all kinds and sizes that we may be able to do it for you.

Let us send one of our engineers, and without charge to you, tell you what we can do for you.

800 Plants Using These Pumps—A Few of the Largest Users

Donnacona Paper Co.
St. Lawrence Paper Co.
Brown Co.
Bogota Paper Board Co.
Bedford Pulp and Paper Co.
Standard Paper Mfg. Co.
Crocker, Burbank Co.
National Paper Products
(At Stockton and Carthage)
Hammond Bag and Paper Co.

Robert Gair Co. of Tonawanda
Flintkote Co.
St. Maurice Paper Co.
Chesapeake Paper Board Co.
Central Paper Co.
Kalamazoo Vegetable Parchment Co.
Abitibi Power and Paper Co.
Brompton Pulp and Paper Co.
John Strange Paper Co.
Kimberly Clark Co.
St. Regis Paper Co.

Waverly Paper Board Co.
United Paper Board Co.
McEwan Bros.
Defiance Paper Co.
Orendo Paper Corp.
Upson Board Co.
Consolidated Power and Paper Co.
Marley Paper Co.
Philip Carey Mfg. Co.
Port Alfred Pulp and Paper Co.

Farnsworth Drainage Receiver and Boiler Feeder (Tilting Type)

FARNSWORTH SYSTEMS ARE SAVING THOUSANDS OF TONS OF COAL DAILY

FARNSWORTH PUMP COMPARED WITH A PISTON PUMP

The Farnsworth Pump operates through cycles similar to that of a piston pump, yet the packings, lubricating oils, pistons, etc., have been eliminated.

They are alike in that they both have inlet and outlet check valves, steam and exhaust valves. They are much alike in principle and general function and differ only in that the piston pump applies steam indirectly while the Farnsworth pump applies the steam directly. The elimination of the piston makes it possible to pump water at any temperature, the higher the better, and at the same time function with less than 25% of the amount of steam required by the piston type pump.

On the first stroke of a piston type pump, water is sucked in through inlet checks; in the Farnsworth Pump the water flows into the tank through inlet checks. Next, with the piston steam pump, steam enters the steam cylinder which is about twice the size of the water cylinder in order that force may be compounded sufficiently to overcome the resistance of packing, piston friction, etc. In the Farnsworth Pump steam enters the tank and the water is forced out of the discharge check valves by direct steam pressure on top of the water obtaining a piston effect without friction, packing or lubrication. The piston pump exhausts and sucks in more water; the Farnsworth Pump exhausts the pressure and lets water flow in.

FARNSWORTH PUMP COMPARED WITH A CENTRIFUGAL PUMP

The average centrifugal pump may require less space than the Farnsworth Pump if it has a constant source of water from which to pump. Usually, however, in all drainage systems in the nature of drying or heating, the centrifugal pump requires a tank to pull from with some kind of automatic control so that the two together occupy as much or more space than the Farnsworth Pump. Space is the only possible advantage that the centrifugal pump might have and this is usually infinitesimal. Further, the centrifugal pump has no metering feature.

The Farnsworth Pump combines the tank and the pump, and between the automatic and the economic features, simplicity and reduced maintenance cost, it ought to appeal favorably to those requiring such equipment.

The centrifugal pump like the piston type *will not pump high temperature water*. In steam plants where condensate is drained there are but few instances where condensate is not at a higher pressure than atmosphere and, therefore, at a higher temperature than 212°. It

Farnsworth Drainage Receiver and Pump

is not economical to heat with steam pressure at or below atmospheric pressure because of the increased radiation surfaces required and the added cost of such radiators or heating units. Therefore, the centrifugal pump will not handle condensate from heating or drying coils until it has been cooled which means a large B. T. U. loss. This B. T. U. loss does not occur when a Farnsworth Pump is used.

COMPARATIVE STEAM CONSUMPTION

Considering the amount of steam that the ordinary centrifugal pump uses, and the amount the Farnsworth Pump uses it may be seen that a large saving would be effected. For illustration, a tank 30" diameter and 6' long

would hold approximately 30 cubic feet of water, or a weight of 1872 lbs. of water. To pump this weight of water into a boiler at a gauge pressure of 100 lbs. in 2 minutes a centrifugal pump using 6.56 H. P. would be required. Since the average steam consumption of a centrifugal pump is about 120 lbs. of steam per horse power hour, or 2 lbs. of steam per horse power minute, the steam consumption in this case would be 26.24 lbs. The Farnsworth Pump, pumping by volume displacement would use just 30 cubic feet of steam, which at this pressure would weigh 7.67 lbs. Thus the steam consumption of the Farnsworth Pump is only one-fourth that of the average centrifugal pump.

ECONOMY FEATURE OF PUMP

Showing Temperature of Steam and Condensate at Various Pressures

Gauge Pressure Pounds per Sq. Inch	Temperature of Steam	Gauge Temperature of Condensate as it flows into Farnsworth Receiver and Pump where pump is set less than 100 ft. from heating or drying system being drained.
	Degrees Fahrenheit	Degrees Fahrenheit
0	212	209
2	219	216
5	227	224
10	240	237
15	250	247
20	258	255
25	267	264
30	274	271
40	286	283
50	297	294
75	320	317
80	323	320
90	331	328
100	338	335
110	344	341
120	350	347
125	353	350
140	360	357
150	366	363

TANK CAPACITIES

Inside Diameter	Lbs. per Lineal Ft.	Add for 2 Heads
18"	111	23
24"	197	54
30"	307	105
36"	442	182
42"	603	288

To find capacity in pounds, multiply the length in feet by the number of pounds per lineal foot and add the number of lbs. contained in the two heads. Example: capacity of a tank 30" by 5'. 5 X 307 plus 105 = 1640 lbs.

PIPE SIZES IN RELATION TO SQUARE FEET OF HEATING SURFACE

2.9 ft. of 1 inch pipe equals 1 sq. ft. of heating surface
2.3 ft. of 1¼ inch pipe equals 1 sq. ft. of heating surface
2.0 ft. of 1½ inch pipe equals 1 sq. ft. of heating surface
1.6 ft. of 2 inch pipe equals 1 sq. ft. of heating surface

To reduce pipes of various diameters to their equivalent in sq. ft. of heating surface divide the length of pipe by figures in first column.

In ordinary low pressure heating calculation figure that one sq. ft. of heating surface will condense ¼ lb. of steam per hour.

In dry kilns or similar work under average conditions a sq. ft. of heating surface will condense ½ lb. of steam per hour.

It requires about 1.2 lbs. of steam to evaporate a lb. of water from paper.

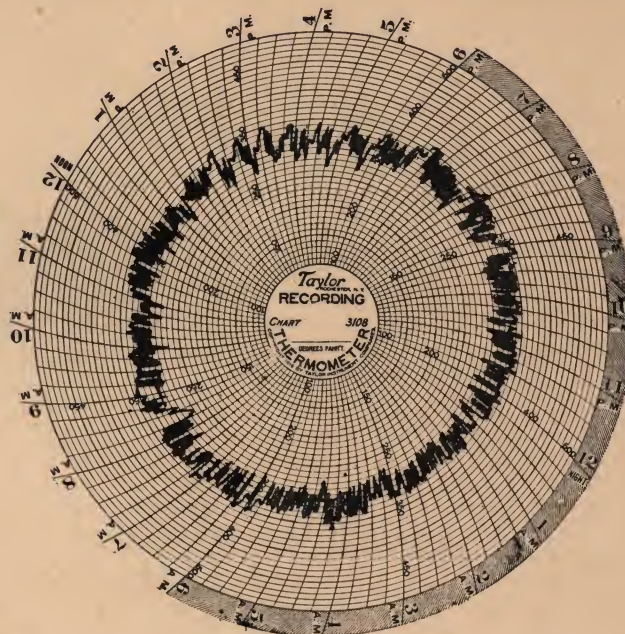
It requires 2.2 lbs. of 4 lbs. of steam to dry a lb. of paper depending on the conditions involved and the kind of paper being made.

	approx.
Hard coal per lb. (Weight is 50 lbs. per cubic ft.)	14,500
Nat. Gas average B. T. U.s per C. ft.	850
Coal Gas average B. T. U.s per C. ft.	630
Petroleum Oils average B. T. U.s per lb.	27,000
Kiln Dried Lumber average B. T. U.s per lb.	8,000
Sawdust and shavings (dry) B. T. U.s per lb.	10,000
BARK—spruce (bone dry) B. T. U.s per lb.	9,500
balsam (bone dry) B. T. U.s per lb.	8,770
jack pine (bone dry) B. T. U.s per lb.	9,870
hemlock (bone dry) B. T. U.s per lb.	9,680
aspens (bone dry) B. T. U.s per lb.	8,460
Coke per lb. (Weight is 28 lbs. per cubic ft.)	13,500
Soft coal per lb. (Weight is 40 lbs. per cubic ft.)	12,000

FARNSWORTH ENGINEERS

Will Show You How to Improve the Circulation through your H. P. and L. P. Heating Coils Heating Systems etc., and Feed the High Temperature Condensate Directly into the Boilers and—

**SAVE 5 to 30%
OF COAL**



RECORD YOUR TEMPERATURES

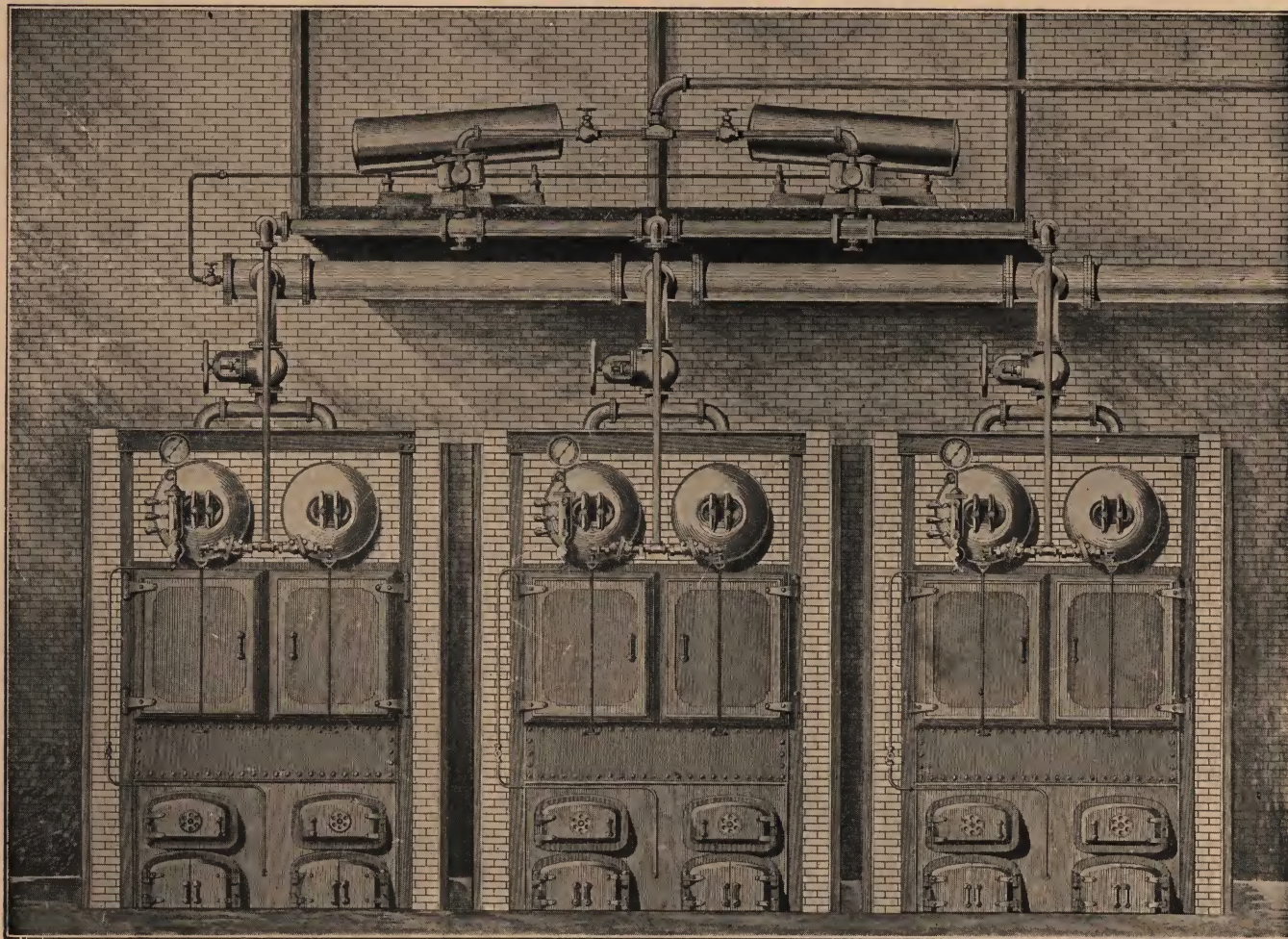
This chart shows temperature of feed water handled with Farnsworth Boiler Feeding System in a plant where a lot of H. P. coils are being used. It shows the temperature of the condensate leaving the coils and the water amounting to many thousand of lbs. per hour is being fed into the boilers at this temperature and has been for several years.

Only equipment exceptionally well made,
SAVES FUEL

Because the condensate never comes to atmosphere itself but is always held under pressure. To close a system without a thorough knowledge of that kind of work is in most instances fatal to production because most operators will put on a trap that clogs circulation and reduces drying and heating capacities. Farnsworth experience has been broad in handling all the drainage problems in many of the largest plants in the world and our service goes with our equipment. We always prefer to give engineering service, plans, and specifications when our various utilities are being installed.

"It saves coal because there's no heat loss"
Said the Fireman to the Boss

Farnsworth Boiler Feeding System



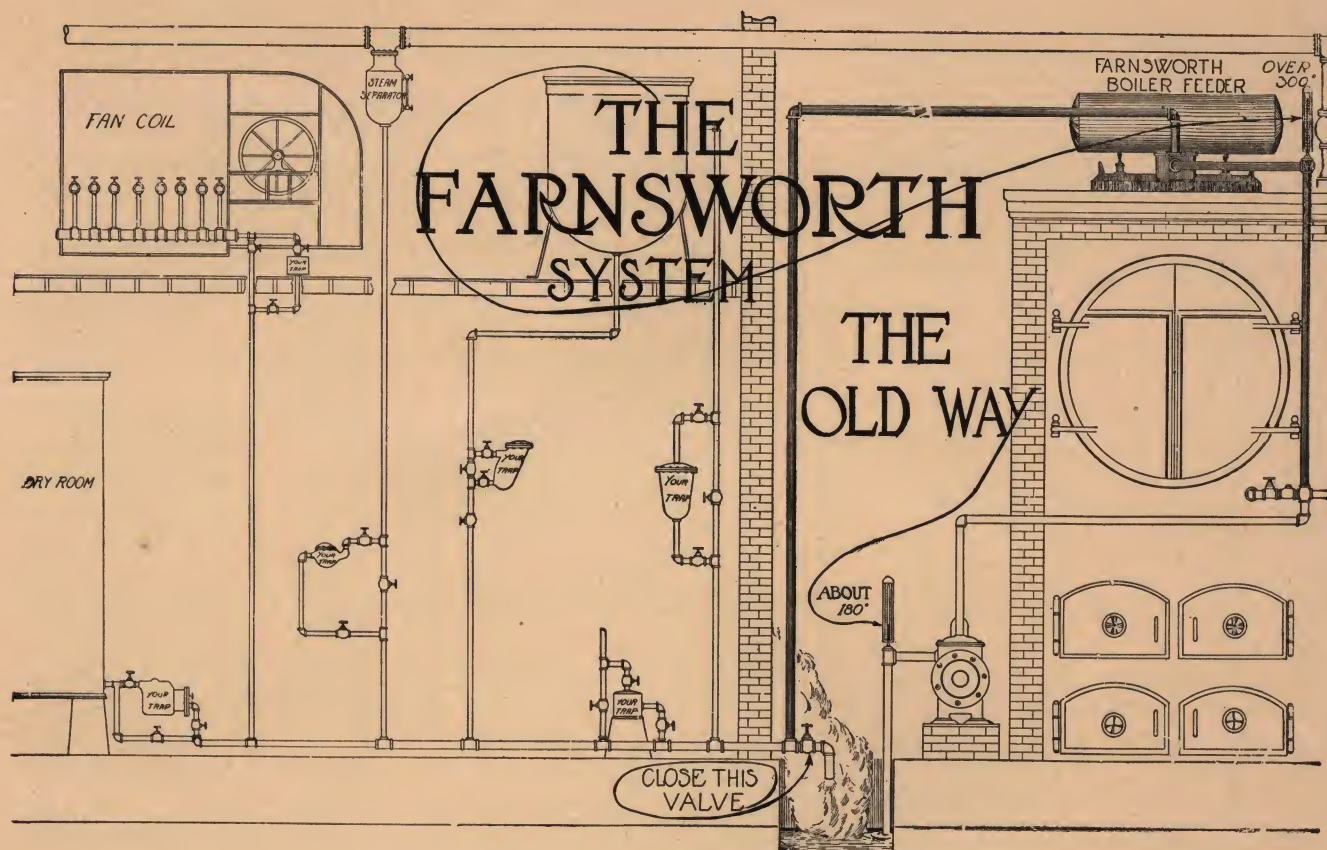
Why Feed Boilers This Way

Because they use $\frac{1}{4}$ the steam that any centrifugal and piston type pump uses and they will handle water at any temperature—the higher the better. They are receiving tanks with no vents which insures that B. T. U.'s cannot escape and thus lower the temperature of condensate such as exists in plants not equipped with Farnsworth Steam Distributing & Pressure Drainage & Pumping Systems.

The duplicate receiving tanks shown above receiving all condensate about the plant—all high pressure traps discharge into the general return line which leads directly to these tanks located above the boiler.

All low pressure condensate with not sufficient pressure behind the water leaving the traps to push the water up to these tanks, is drained to a Farnsworth Drainage Receiver and Pump which has a H. P. steam connection that automatically pumps the L. P. condensate up to these main and central receiving tanks, which alternately fill and discharge into the boiler alternately and use the pressure equalization principle which causes the water to flow into the boilers by gravity and the speed of the water is determined by the difference in the water levels in the boiler feeder and the water level in the boiler.

Catching the Elusive B. T. U.



READ THIS—IT'S IMPORTANT

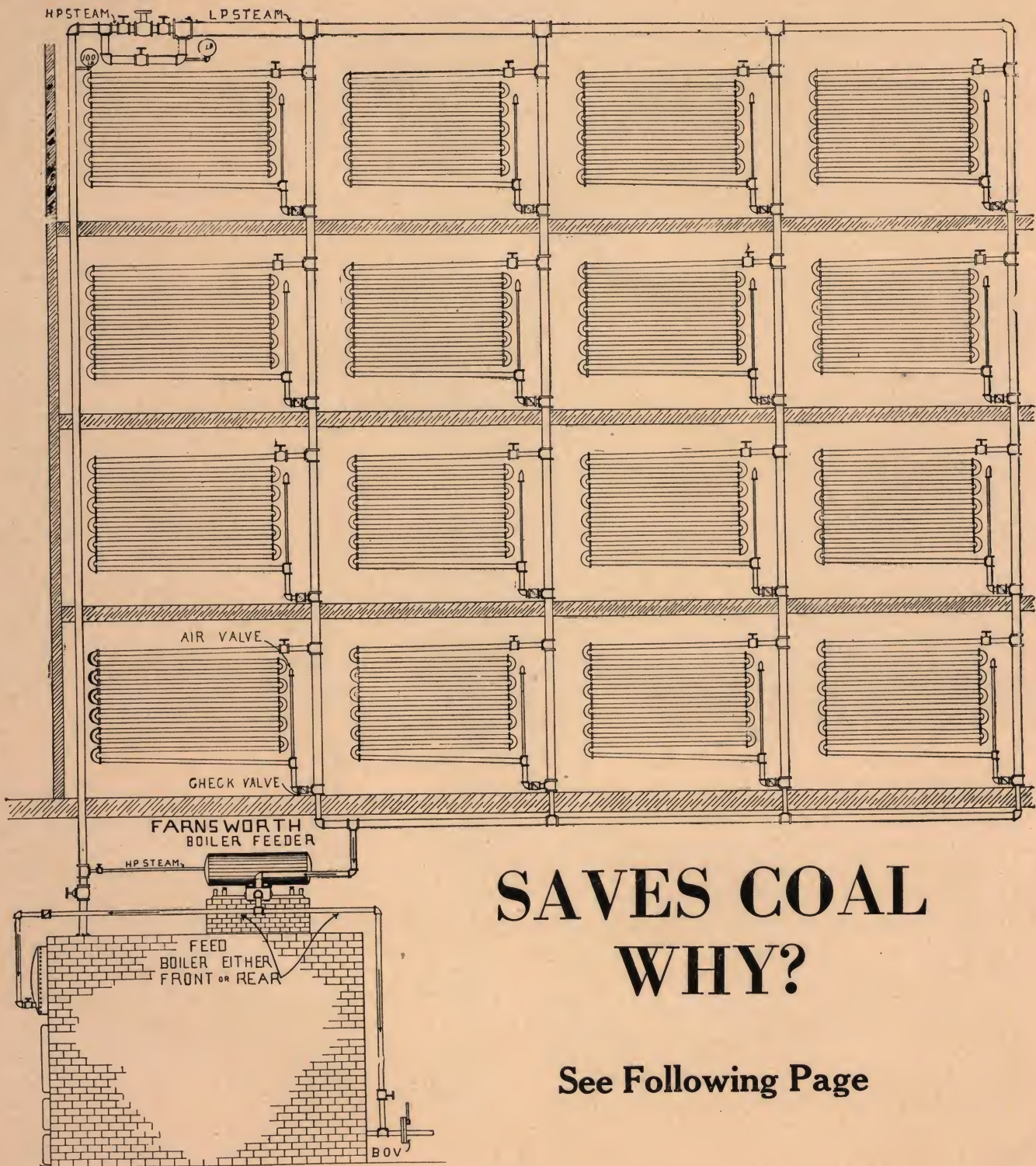
Water at high temperature contains B. T. U.'s. Water will retain these B. T. U.s only if held under pressure. The Farnsworth System of using tanks that are sealed and held under pressure is our means of preventing them from getting away to the atmosphere and is the only efficient means of pumping very high temperature water.

The difference in temperature between the old way of pumping and the Farnsworth way does not represent the total saving. Our years of experience in equipping many hundreds of plants has proved, that on the average,

it represents not even half the saving that is made, by closing up the system and stopping the losses of steam through the avenues of leaking traps and open hot wells, receiving tanks, heaters, etc.

The Farnsworth way seals the system right. Not a B. T. U. can get away. More than a million dollars a day is lost in U. S. A. from open vents and by-passed traps, inefficient pumps and loss in production due to inefficient drying and heating, that Farnsworth Systems, equipment and experience and organization could correct.

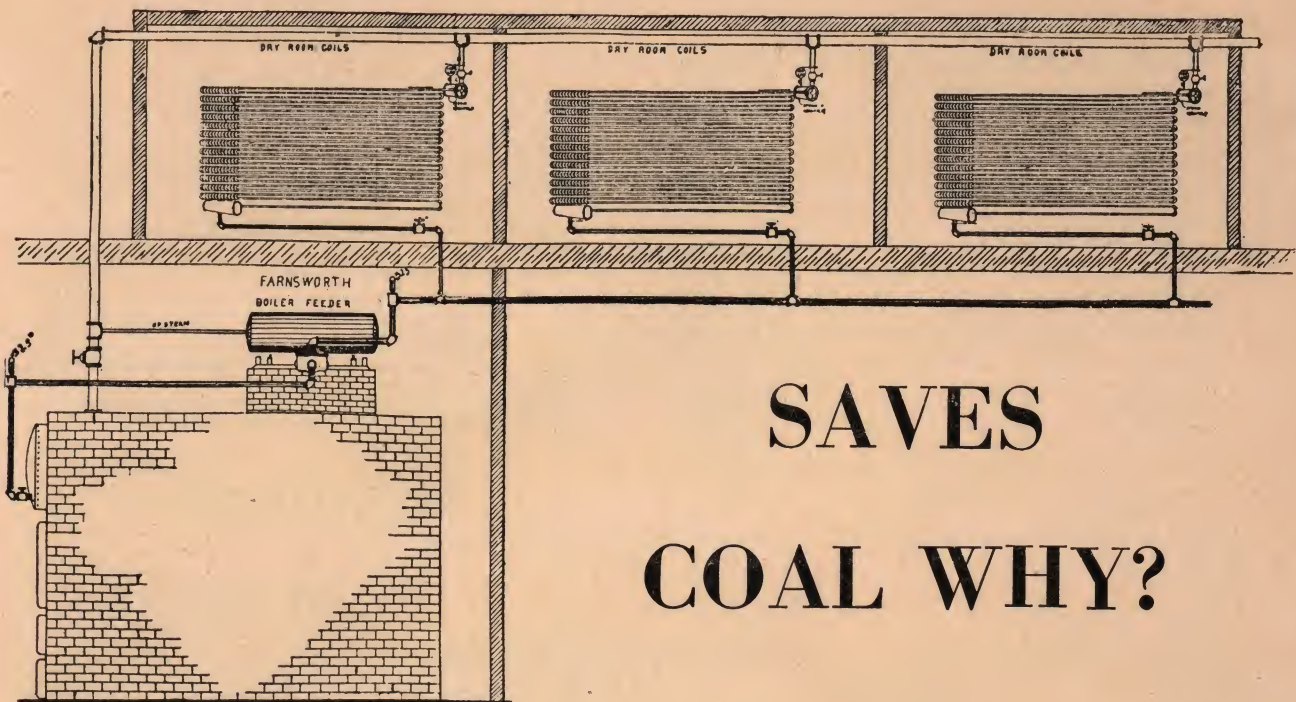
Loft Heating Coils Drained and Fed into Boilers at Temperature of Steam



SAVES COAL WHY?

See Following Page

Draining H. P. Coils Feeding Directly Into Boiler



Because the Feed Water Is at H. P. Steam Temperature

The condensate is fed into the boiler at the temperature of steam and is never allowed to get from under pressure.

The coils may be all under the same pressure and without steam traps on each coil. Further, the coils may be located below the boiler and the condensate will be fed into the boilers equally as well.

The boiler feeder simply acts the same as a steam trap would on the end of the line except that the Boiler Feeder automatically feeds the high temperature condensate right into the boilers as fast as it is received.

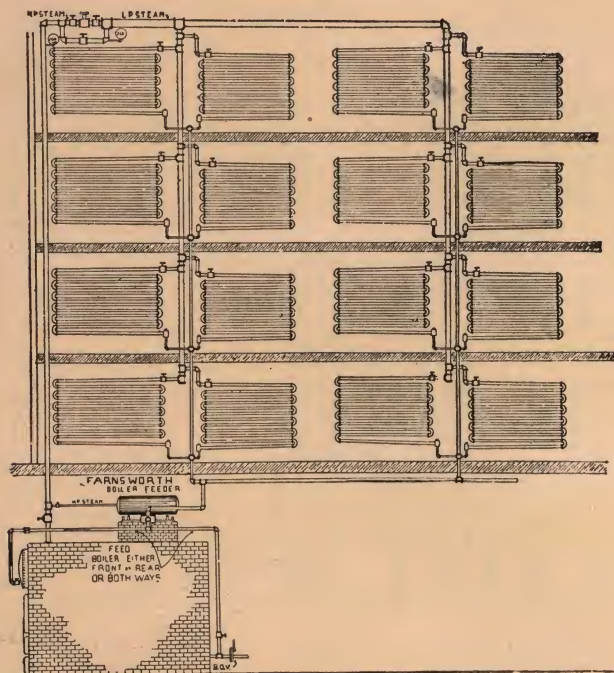
EXAMPLE

Assume a 100 H. P. boiler, supplying steam at 51 lbs. pressure, the temperature of steam would be 300 degrees, the temperature of the

condensate would be 300 degrees, as it is fed into the boiler the Farnsworth way. Assume the average job, where the ordinary trap was used, with the common receiver pump etc., with the water going into the boilers at 210 instead of 300 the Farnsworth way, a saving of 90 Btu's per pound of water or in 100 HP. 3400 lbs. of water times 90 degrees or a saving of 306,000 Btu's per hour.

Any one can figure the saving, in fact they do not have to figure when they have water 90 degrees hotter. The old thumb and rule way shows 9% but actually more than 9% because every avenue of escaping Btu's are closed up that is the Farnsworth way requires no open vented heater or hot well or receiving tank and means simplicity personified.

Vacuum System Advantages Without Vacuum Pump



**SAVES
COAL
and
Motor Driven
Vacuum
Pumps**

BETTER HEATING & WHY?

Showing how the Farnsworth Receiver and Boiler Feeder may be placed directly over boiler for draining and feeding direct where the boiler is lower than all heating units.

FARNSWORTH BOILER FEEDERS ARE ADAPTABLE TO VACUUM SYSTEMS.

There is a mistaken impression in that vacuum pumps are necessary. For illustration. in the so-called vacuum systems for L. P. heating with a vacuum valve on each radiator or coil, whenever the vacuum pump draining a return line fails, the condensate usually has to be by-passed into the sewer until the vacuum pump is repaired. There never was a job called a vacuum system with vacuum valves on each radiator that did not work equally well or better with the return line open to the sewer than with the vacuum pump running, especially if the return line is large enough and properly run. Our point is that water from the return line will surely flow into our drainage re-

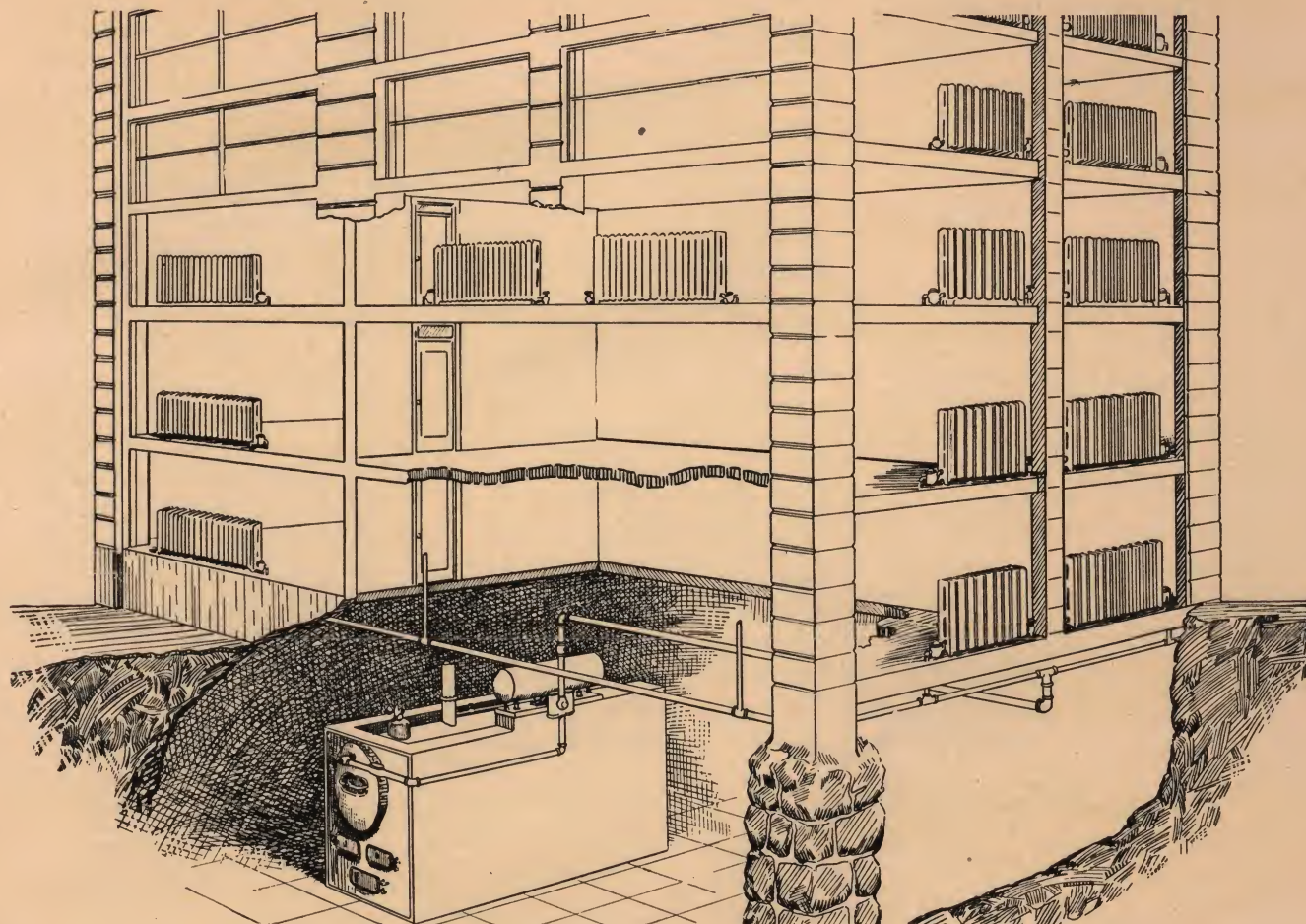
ceiver tank as freely as it will flow into the sewer. The air is freely separated and the hot water fed directly into the boilers.

The Farnsworth Drainage Receiver and Pump, in small or large units, drains the L. P. condensate at its source, and at the temperature at which it leaves the heated units, and keeps the water at the high temperature because there is no vent except air relief.

Vacuum pumps pull the vapors off the condensate and lower to temperature equal to the vacuum drawn, and those vapors are discharged to waste and cause a direct loss of B. T. U.s amounting to millions daily.

Example: one lb. steam pressure going to the radiator with Farnsworth System, waters fed into boiler at 212 degrees with the vacuum pump system with steam going to radiator at 1 lb. and with vacuum at vacuum pump or water at 193 or a loss of 19 B. T. U.s each lb. of water fed into boilers, in addition to the cost of operating the vacuum pump, etc.

Why Use Vacuum Pumps—They are Wasteful and Useless



Suction on Radiator Traps Unnecessary

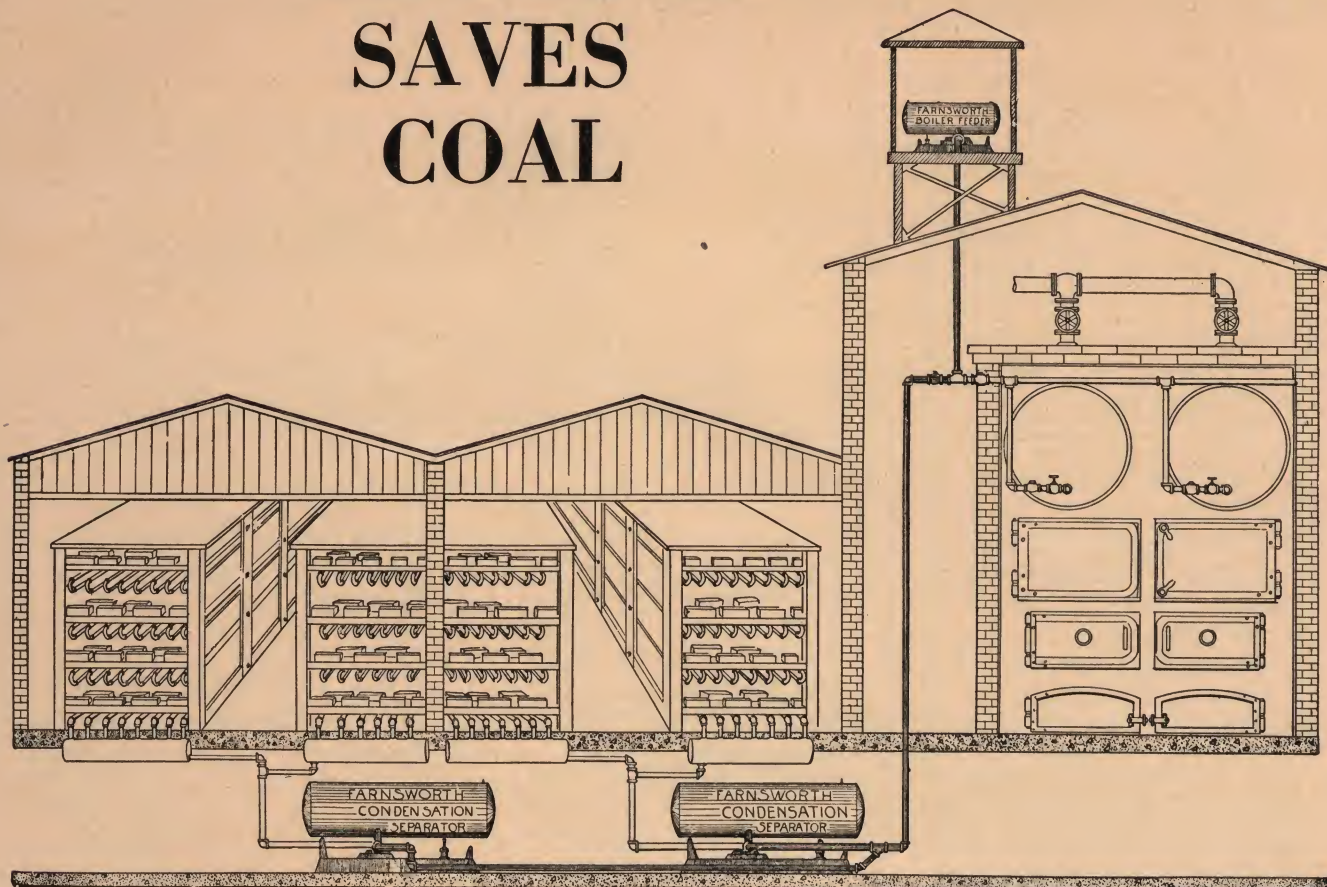
The Farnsworth Drainage Receiver and Boiler Feeder has an open vent and the air is vented freely from the return lines.

The hot condensate from the radiators flows into the receiving tank providing an open

return line for immediate release of air and the condensate is at a temperature higher than from any vacuum pump and is fed into the boilers automatically. It saves coal and the power that is required to operate the vacuum pump.

Showing Methods Draining Under Pressure Pumping and
Boiler Feeding That—

SAVES COAL

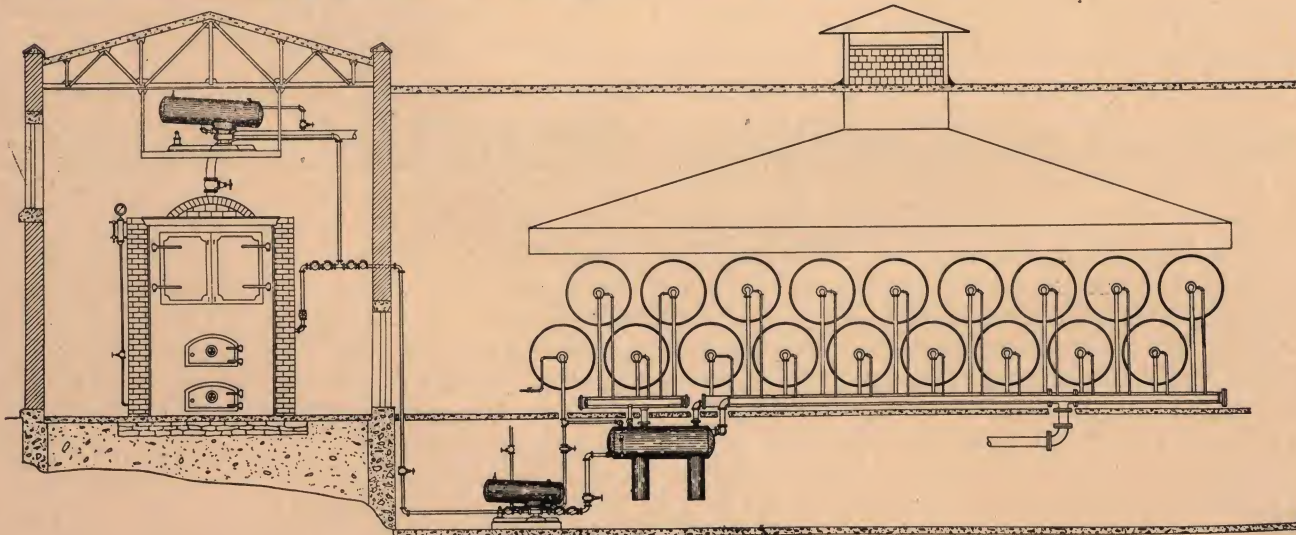


Dry Kilns Systems

Drains the high temperature condensate from the various coils and pumps it into one common line leading to the boiler feeder which

keeps the high temperature condensate moving into the boilers.

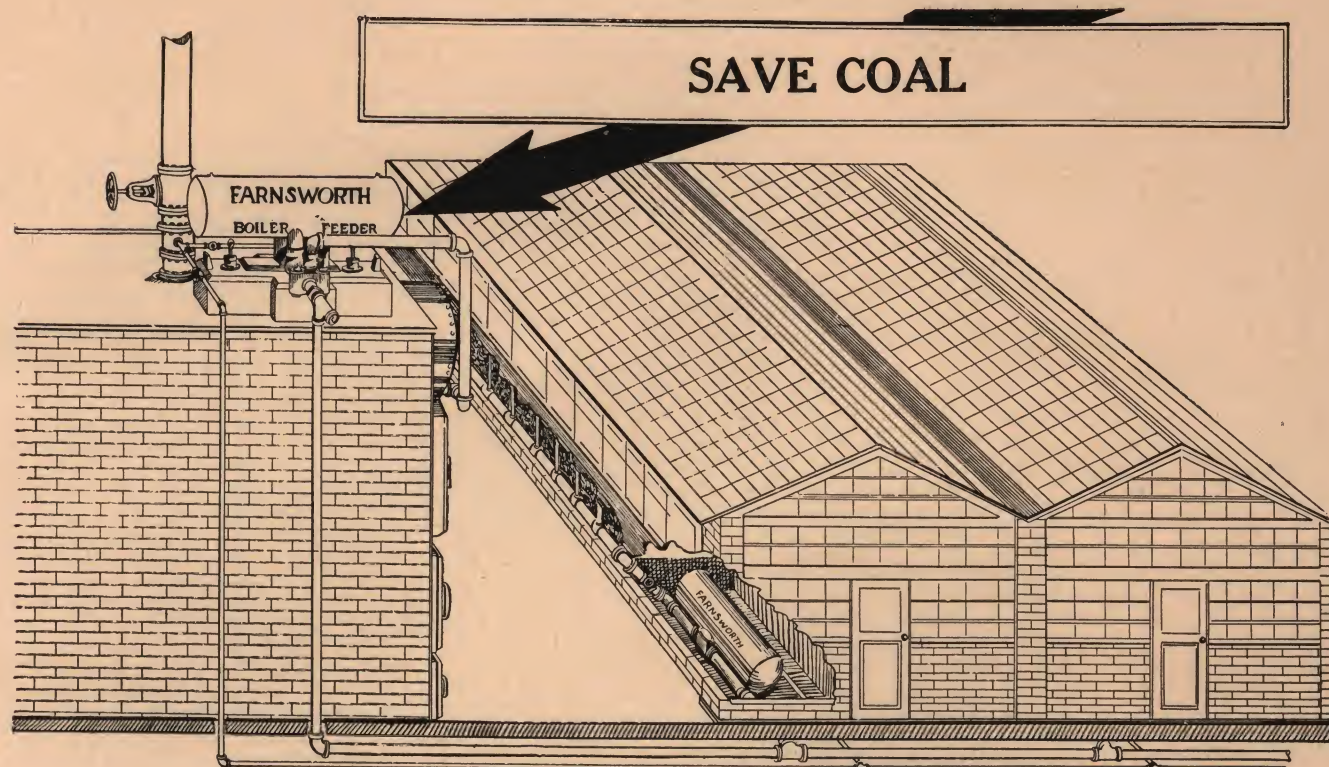
The simplicity of this system in itself spells economy.



Paper Mill Systems

Draining a small Paper Machine and pumping the high temperature Condensate directly into Boilers at temperature equal to temperature of steam in dryers.

Draining Isolated Buildings and Coil Heaters



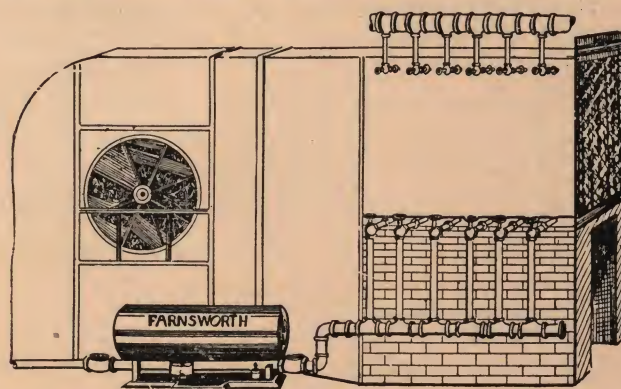
Farnsworth Pressure Drainage and Pumping Systems

require but small lines from the scattered heating units or buildings being drained, because the water is drained under pressure and is delivered under pressure and at high speed from the various units into the boiler house.

The pumps located at different points about the plant drain the various low pressure system paper machines, or heating units, and as fast as the tanks are filled with L. P. condensate, the H. P. steam is automatically applied. This forces the very hot condensate through the small discharge lines into one main trunk line, leading to a large drainage receiver and pump in either simplex or duplex type located somewhere above the boiler.

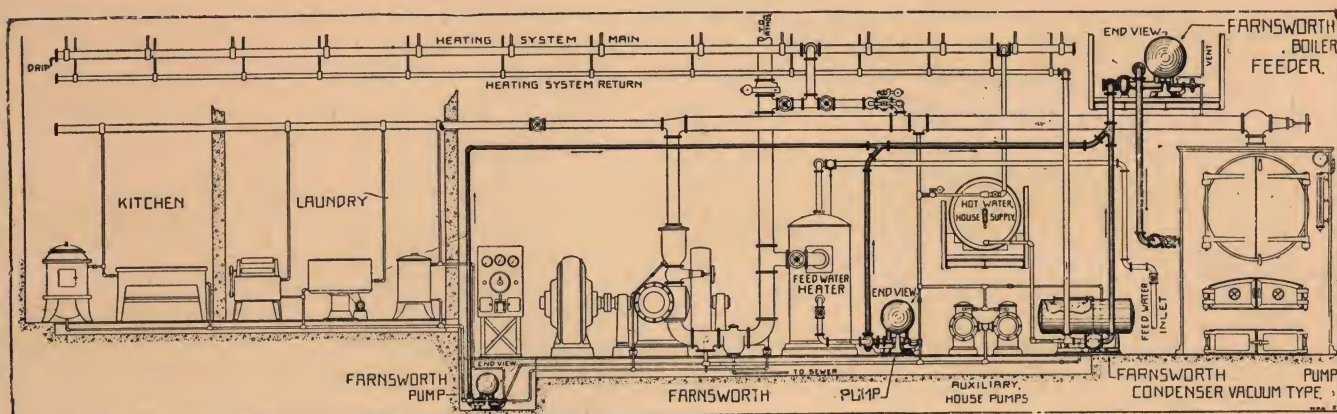
Save the B. T. U. s that are represented as between the temperature of steam carried on

the coils and the temperature of the condensate, usually lower than 200 degrees, as cooled down in average hot well or receiving tank.



Heating Coils drained and pumped under pressure.

Pressure Drainage and Pumping to Boiler Feeding System for Laundries and Textile Mills



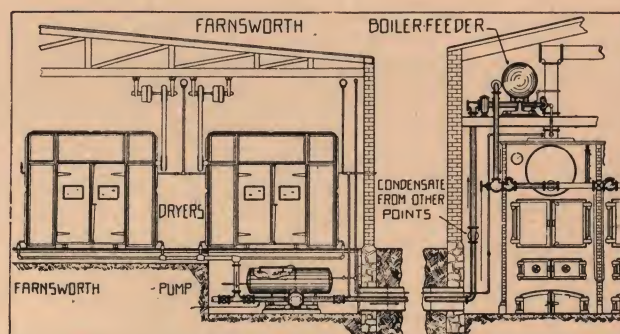
Pressure drainage for laundries or textile mills means that all H. P. Traps about the plant discharge directly to the boiler feeder which means that at H. P. temperature, condensate is held under pressure and the sensible heat is retained, because the boiler feed receiving tank is closed.

All condensate from the building heated by exhaust steam is drained to a Farnsworth Drainage Receiver and Pump that automatically applies H. P. steam to push the L. P. condensate into the main trunk return line also carrying the high temperature condensate from the H. P. Traps and leading to the boiler feeder receiving tank.

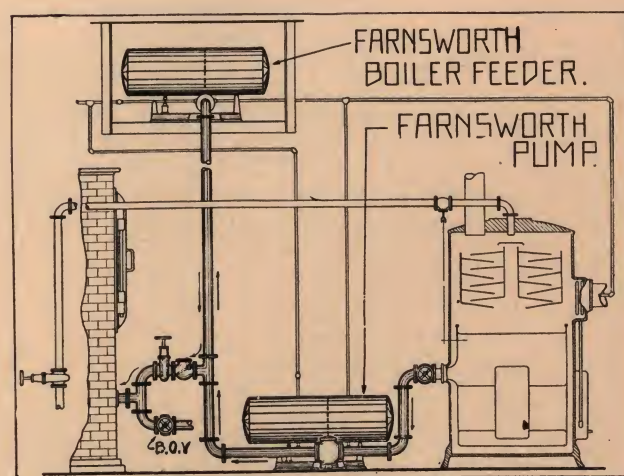
The condensate from the hot water heater, that heats water for process work, is drained to a Farnsworth Drainage Receiver and Pump and is automatically fed to the Boiler Feeder and is controlled by the fireman because all condensate is automatically fed into the boilers as fast as it accumulates. The temperature of all condensate going into boilers is represented by the average quantities and temperature of the high and low pressure condensate when mixed in the main trunk return line and the make up water is heated to the temperature of the exhaust steam so that the total water for the boiler is at the highest temperature. There is not a single heat loss from the avenues usually prevalent where open heaters and hot wells are used.

Laundries Appreciate Farnsworth's Broad Experience and
Reliable Equipment

**MORE
THAN
1000
STEAM
PLANTS
USING
FARNSWORTH
SYSTEMS
and
EQUIPMENT**

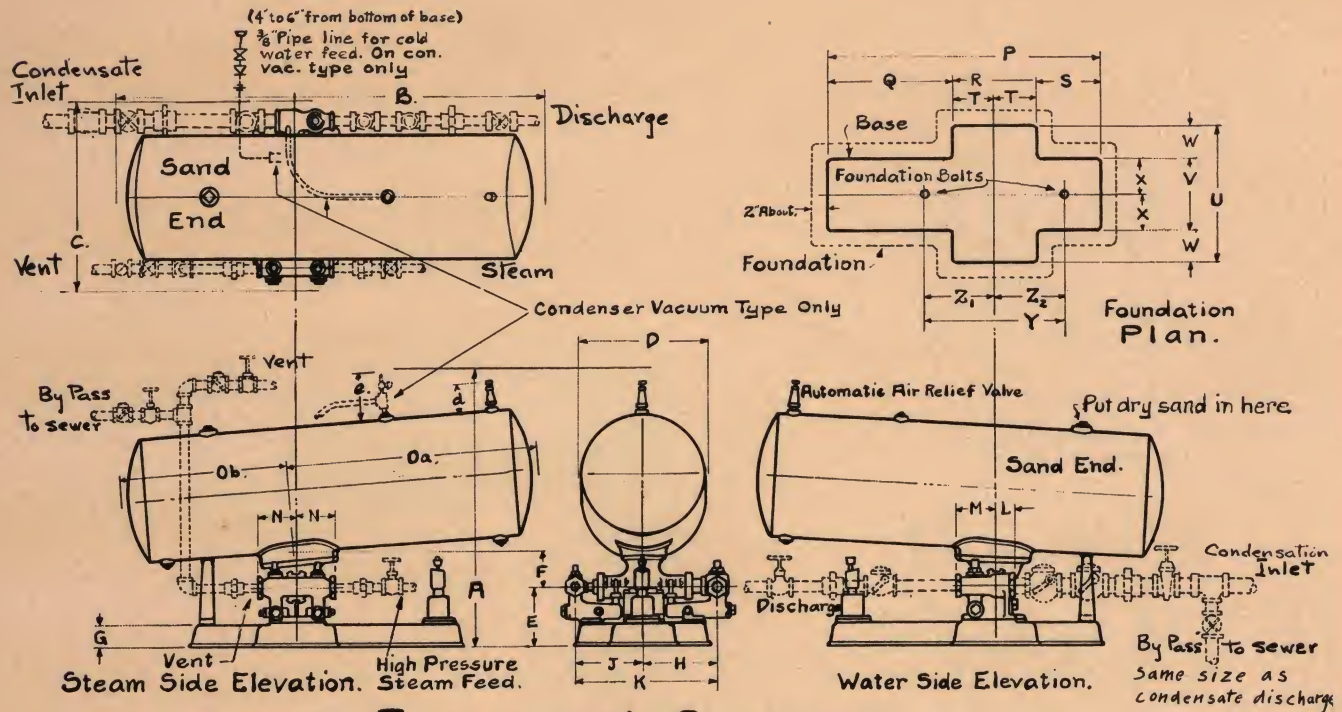


Draining Coil Dry Rooms.



Draining Open Feed Water Heater.

Farnsworth Drainage Receiver and Pump Three Valve Pumping Type



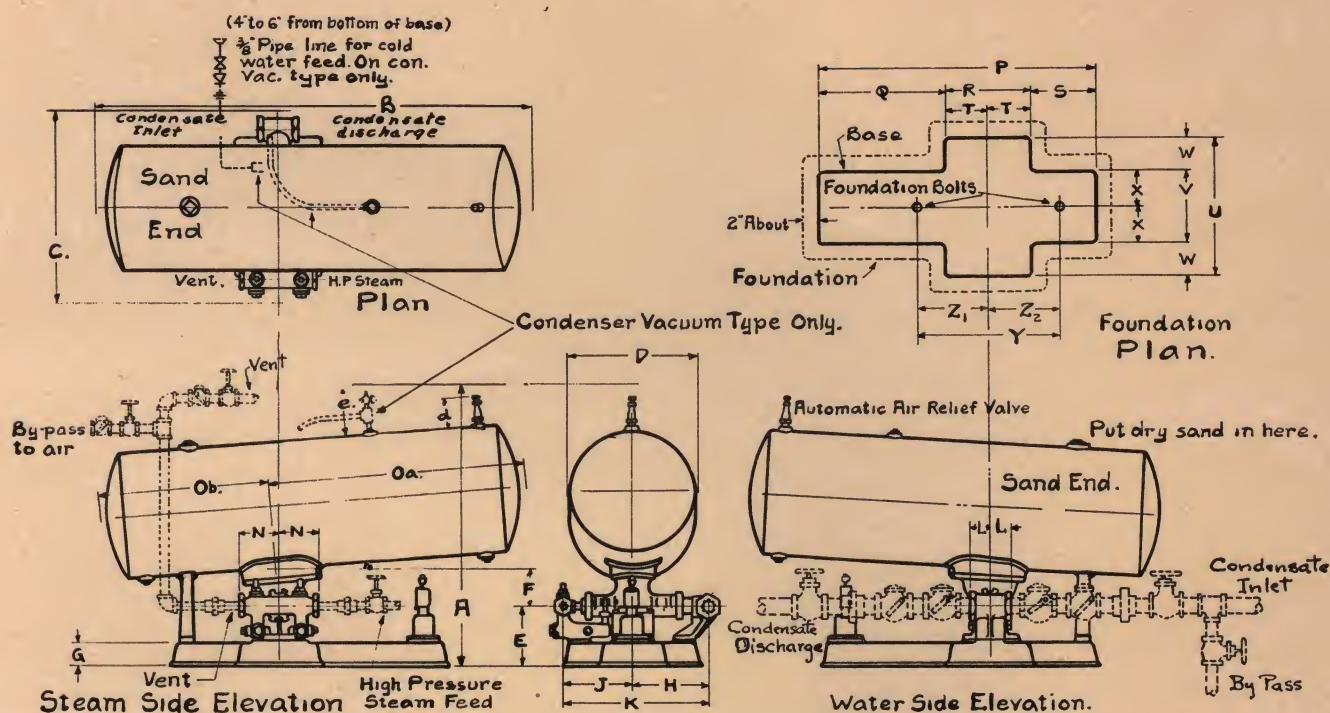
Farnsworth Company.
Conshohocken, Penna.

Size Mch.	PIPE SIZES							CONDENSATE DISCHARGE PER OPERATION OF PUMP	Overall Dimensions.			WEIGHT		AMOUNT OF SAND TANK HOLDS
	Inlet.	Dis- charge	H.P. Feed	Vent	By Pass	Water	Vent By Pass		Height A.	Length B.	Width C.	UNCRATED	CRATED	
1"	1"	1"	3/4"	3/4"	1"	1/2"	3/4"	96 LBS.	30	50	20	265	340	97 LBS
1 1/2"	1 1/2"	1"	3/4"	3/4"	1"	1/2"	3/4"	110 "	32	50	20	305	380	120 "
2"	2"	1 1/4"	1"	1"	1 1/4"	1/2"	1"	165 "	36	60	24	425	505	146 "
3"	3"	1 1/2"	1 1/4"	1 1/4"	1 1/2"	1/2"	1 1/4"	237 "	40	62	30	660	815	330 "

Size Mch.	D	Inside Dia. Tank	Oa	Ob	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z ₁	Z ₂	Size Founda- tion Bolts	d	Can Vac. e. Only
1"	13	12	27 $\frac{1}{2}$	18 $\frac{1}{2}$	6 $\frac{1}{4}$	4 $\frac{1}{4}$	2 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{4}$	14 $\frac{3}{4}$	1 $\frac{15}{16}$	3 $\frac{11}{16}$	4	3 $\frac{11}{16}$	14	9 $\frac{1}{8}$	8	4 $\frac{9}{16}$	15 $\frac{1}{8}$	8 $\frac{1}{8}$	3 $\frac{1}{2}$	4 $\frac{1}{16}$	13	7 $\frac{1}{4}$	7 $\frac{1}{4}$	$\frac{1}{2}$	4	
1 $\frac{1}{2}$ "	15	14	27	19	6 $\frac{1}{4}$	4 $\frac{1}{4}$	2 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{4}$	14 $\frac{3}{4}$	1 $\frac{15}{16}$	3 $\frac{11}{16}$	4	3 $\frac{11}{16}$	14	9 $\frac{1}{8}$	8	4 $\frac{9}{16}$	15 $\frac{1}{8}$	8 $\frac{1}{8}$	3 $\frac{1}{2}$	4 $\frac{1}{16}$	13	7 $\frac{1}{4}$	7 $\frac{1}{4}$	$\frac{1}{2}$	4	
2"	17	16	32 $\frac{1}{2}$	21 $\frac{1}{2}$	7 $\frac{3}{4}$	4 $\frac{3}{4}$	3 $\frac{1}{4}$	9 $\frac{3}{4}$	9	18 $\frac{3}{4}$	2 $\frac{3}{8}$	5 $\frac{3}{8}$	5	36 $\frac{1}{4}$	16 $\frac{1}{2}$	11 $\frac{1}{4}$	8 $\frac{1}{2}$	5 $\frac{5}{8}$	17 $\frac{3}{4}$	9 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{5}{8}$	15 $\frac{1}{8}$	9	9	$\frac{1}{2}$	4	
3"	20 $\frac{3}{4}$	20	37	26	9 $\frac{1}{2}$	6 $\frac{1}{4}$	4	13 $\frac{3}{4}$	11 $\frac{1}{2}$	25 $\frac{1}{4}$	3 $\frac{3}{8}$	6 $\frac{11}{16}$	6 $\frac{3}{16}$	42 $\frac{1}{2}$	17 $\frac{3}{4}$	16 $\frac{1}{4}$	8 $\frac{1}{4}$	19 $\frac{3}{4}$	9 $\frac{3}{4}$	5	4 $\frac{7}{8}$	2 $\frac{1}{16}$	17	6	3 $\frac{1}{4}$	4		

Showing dimension and method of piping. See Page 4.

Farnsworth Drainage Receiver and Pump Boiler Feeding Type



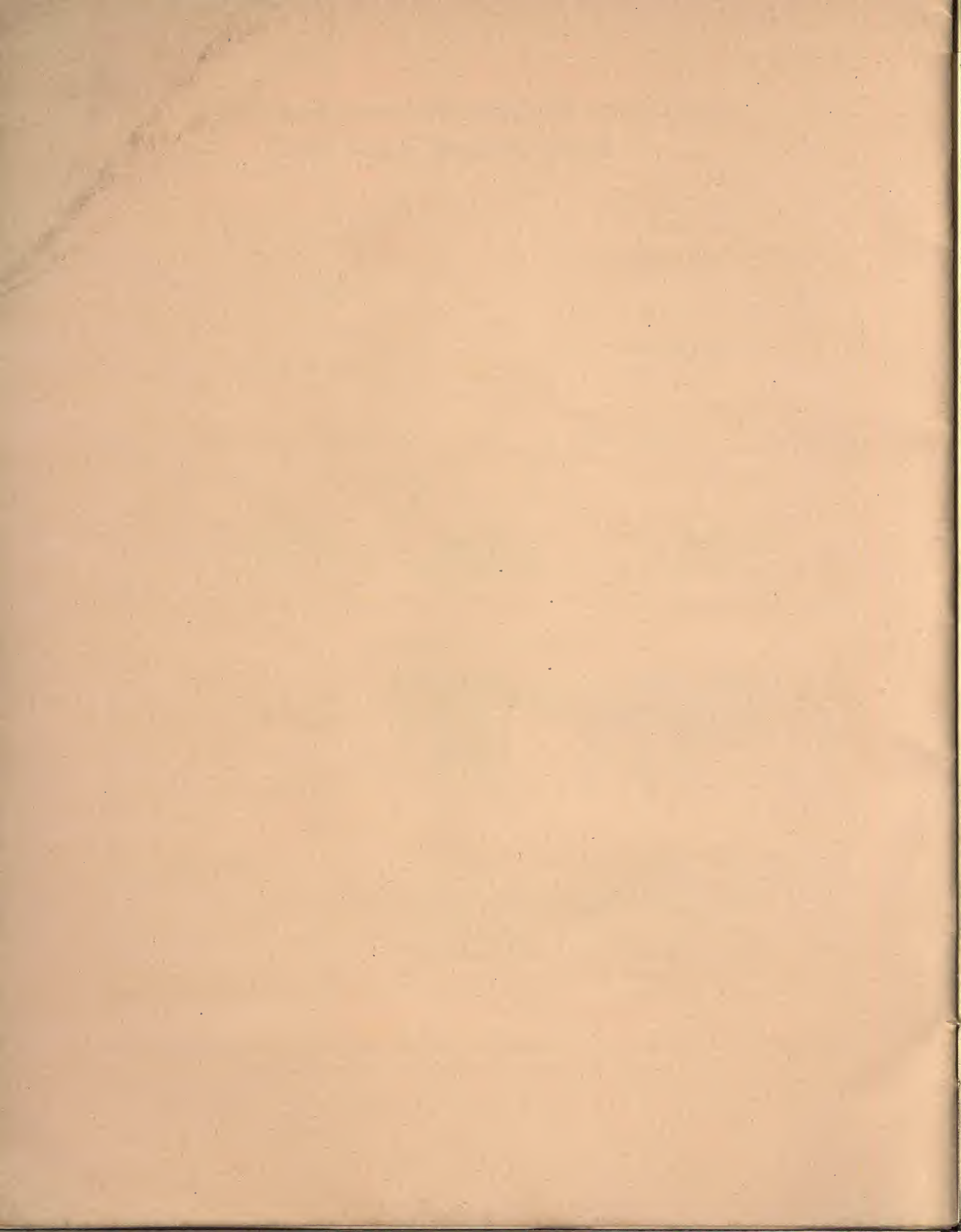
Farnsworth Company.

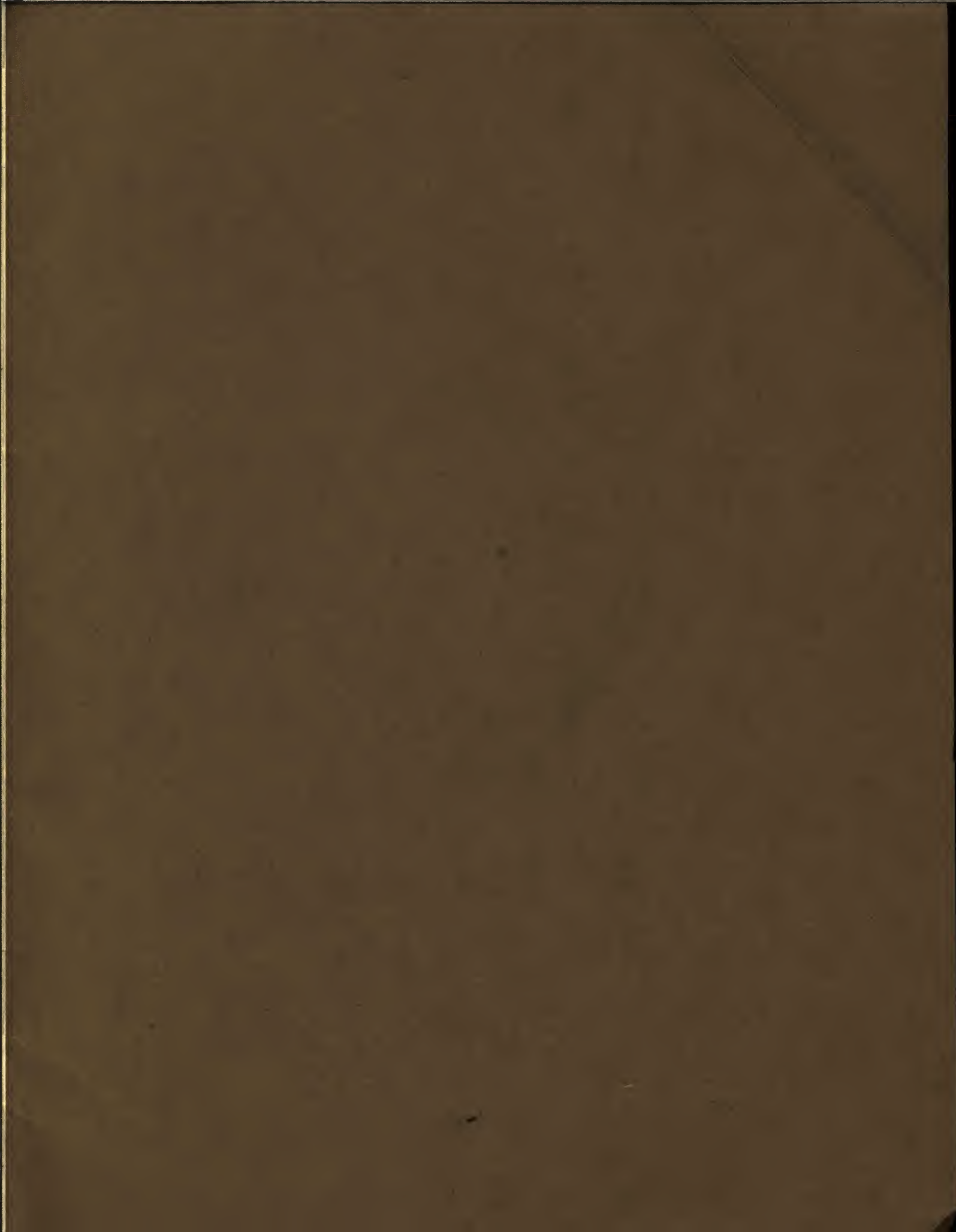
CONSHOHOCKEN, PENNA.

Size M'ch.	PIPE SIZES						disch. when used as pump	condensate discharge per operation of pump	Overall Dimensions			AMOUNT OF SAND TANK HOLDS	WEIGHT OF MACHINE	SHIPPING WEIGHT	
	Inlet	Dis- charge	H.P. Feed	Vent	Water	Height A.			Length B.	Width C.					
1"	1"	1"	3/4"	3/4"	1/2"	1"	96 lbs	30	50	18	94 LBS	254 LBS	329 LBS		
1 1/2"	1 1/2"	1 1/2"	3/4"	3/4"	1/2"	1"	110 lbs	32	50	19	120 "	294 "	369 "		
2"	2"	2"	1"	1"	1/2"	1 1/4"	165 lbs	36	60	24	146 "	409 "	487 "		
3"	3"	3"	1 1/4"	1 1/4"	1/2"	1 1/2"	237 lbs	40	62	29	330 "	632 "	787 "		

Size M'ch.	D	Inside Dia. Tank	Oa	Ob	E	F	G	H	J	K	L	N	P	Q	R	S	T	U	V	W	X	Y	Z ₁	Z ₂	Size Found- ation Bolts.	d.	Con. Vac. only e.
1'	13	12	27½	18½	6¼	4¼	2½	7	7¼	14¼	2	4	31½	14	9½	8	4½	15½	8½	3½	4½	13	7¼	7¼	½	4	
1½	15	14	27	19	6¼	4¼	2½	7½	7¼	14¾	2	4	31½	14	9½	8	4½	15½	8½	3½	4½	13	7¼	7¼	½	4	
2"	17	16	32½	2½	7¾	4¾	3¼	9¾	9	18¾	2¼	5	36¼	16½	11¼	8½	5⅝	17¾	9¼	4¼	4⅝	15⅝	9	9	½	4	
3"	21	20	38	24	9¾	5¼	4⅛	13½	11¼	24¾	3⅛	5	42¼	17¾	16½	8	8¼	19½	9½	5	4¾	21⅝	-	-	½		

Pump Page 4, showing dimensions and method of piping. This type has no water outlet valve.





FARNSWORTH

CONSHOHOCKEN